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| (54) Title: <b>RAW MATRIX FOR OPTICAL STORAGE MEDIA AND A METHOD OF MANUFACTURING SUCH A MATRIX</b>  |    |  |
| (57) Abstract  |    |  |
| <p>In a method of manufacturing a matrix for making optical storage media a plate-shaped matrix body is formed. Then a resist coating is applied on one side of the body by spinning a polymer over the body starting from a central portion of the body with a view to forming a blank for a matrix. Finally a central opening is formed in the body, preferably by punching the central portion of the body, thereby forming a raw matrix with a resist coating extending from the peripheral edge of the central opening.</p> |    |  |

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Raw matrix for optical storage media and a method of manufacturing such a matrix.

The present invention relates to a method of manufacturing a matrix for making optical storage media. The invention also relates to a blank for a matrix as well as a raw matrix.

5 When making optical storage media, such as compact disks, use is made of what is referred to as matrixes as a form for the information-carrying structure of the storage medium. The matrix constitutes one half of a mould for moulding said storage media. A matrix consists of a circular, planar plate of metal, in which 10 a central opening is formed. The opening is used in the making of storage media.

In the methods that are traditionally used for making optical storage media, matrixes of metal are 15 manufactured one by one by the matrixes being built up on a substrate provided with a pattern. This is time-consuming and costly work which comprises a plurality of steps of manufacture and which places high demands on advanced equipment for manufacturing 20 the matrixes.

Therefore an object of the present invention is to provide an improved method of manufacturing matrixes for making optical storage media.

A specific object is to provide a rational method of 25 manufacturing matrixes.

A special object is to ensure a high quality in the manufacture of matrixes.

According to the invention, these and other objects that will be apparent from the following description are 30 now achieved by a method according to appended claim 1.

The objects are also achieved by a blank for a matrix according to appended claim 6 and by a raw matrix according to appended claim 7. Preferred embodiments are defined in the dependent claims.

The invention is based on the idea of manufacturing in a first step a "raw matrix", which in a subsequent step is provided with an inscription by working the surface of the raw matrix.

5 According to a first aspect of the invention, a plate-shaped matrix body is formed, on which a resist coating, such as a photoresist coating, is applied on one side. This is achieved according to the invention by spinning a polymer over the body starting from a central 10 portion of the body.

By spinning the polymer from the central portion, a uniform resist coating can easily be obtained over the entire plate-shaped body. Any irregularities are limited to the central portion.

15 After the forming of the resist coating, a central opening is formed in the body by removing the central portion, preferably by punching the central portion of the body. As a result, the entire resist coating will be uniform from the edge of the opening radially outwards. 20 Thus the matrix can be provided with a high-quality inscription up to the edge of the opening.

By spinning, in accordance with the inventive concept, the resist coating from a central position and only then punching a central opening, a higher quality, a 25 larger writing surface and lower manufacturing costs will be obtained than in the case where the resist coatings are spun after the opening has been punched.

The opening formed after removal of the central portion preferably constitutes the final opening which is 30 used in the making of optical storage media. It is preferred for the matrix body to cover the entire central portion when applying the resist since the resist material can thus be spun from a single central position. However, the invention is not limited in this respect. It 35 may in some cases be advantageous to form a smaller opening in the body and apply the resist starting from a central area round the smaller opening, whereupon the cen-

tral area is removed. Also this embodiment is included in the inventive concept as will be expressed in the appended claims.

In a preferred embodiment there is formed in a subsequent step an information-carrying inscription in the resist coating by an irradiation (exposure) and developing process in some prior art manner, whereupon a corresponding structure is formed in the matrix body by an etching or application process.

According to a second aspect of the invention, it comprises a blank for a matrix, which has a plate-shaped matrix body extending from a central portion to a circular peripheral line, and a resist coating extending radially outwards from the central portion of the body. The central portion is adapted to be removed in a subsequent step. No final central opening has thus yet been formed in the matrix body. In a particularly preferred embodiment, the blank has no opening at all inside the peripheral line.

According to a third aspect of the invention, it comprises a raw matrix with a plate-shaped matrix body, which has a central opening and a resist coating extending from the peripheral edge of the central opening and having a uniform thickness. The raw matrix, which in itself constitutes an intermediate product in the manufacture of a completed matrix, has thus been manufactured by forming a central opening in the matrix blank described above. Then no further change or working of the inner diameter or outer diameter is made after exposure or forming of structure, for instance by an etching or application process.

A preferred embodiment of the invention will now be described for the purpose of exemplification.

A matrix body in the form of a circular disk of nickel is formed. A suitable volume of a suitable resist material is placed in the centre of the disk, whereupon the disk is rotated so that the resist material is spun

to a uniform layer over the matrix body which then constitutes a blank for a matrix. Subsequently, the central portion of the disk is punched, thereby forming a raw matrix. The raw matrix undergoes lithographic processing,  
5 in which an information-carrying pattern is exposed to radiation and developed according to prior art methods, so that the matrix body is uncovered in selected surface portions in a pattern corresponding to the information with which the matrix is to be provided. Then a structure  
10 is etched into the matrix body in the uncovered surface portions. Finally the rest of the resist coating is removed, thereby forming a completed matrix with an information-carrying surface structure. Optionally the surface structure is given a protective treatment before  
15 the matrix is ready for use.

## CLAIMS

1. A method of manufacturing a matrix for making optical storage media, characterised by the steps of
  - 5 forming a plate-shaped matrix body,
  - 10 applying a resist coating on one side of the body by spinning a polymer over the body starting from a central portion of the body, and
  - 15 forming, after said step of application, a central opening in the body provided with a resist coating by removing the central portion, preferably by punching the central portion of the body.
- 15 2. A method as claimed in claim 1, wherein said opening is formed such that the resist coating extends from a peripheral edge which defines said opening.
- 20 3. A method as claimed in claim 1 or 2, wherein the central opening is formed in the body before the resist coating is provided with an information-carrying inscription.
- 25 4. A method as claimed in claim 3, wherein the information-carrying inscription is formed in the resist coating by a subsequent exposure and developing process.
- 25 5. A method as claimed in claim 4, wherein a structure corresponding to the inscription in the resist coating is formed in the matrix body by an etching or application process.
- 30 6. A blank for a matrix for optical storage media, characterised by a plate-shaped matrix body extending from a central portion which is adapted to be removed, to a circular peripheral line, and a resist coating extending radially outwards from the central portion of the body.
- 35 7. A raw matrix for optical storage media, characterised by a plate-shaped matrix body, which comprises a central opening and a resist coating

extending from the peripheral edge of the central opening, the resist coating having a uniform thickness from said peripheral edge radially outwards.

8. A raw matrix as claimed in claim 7, which, with  
5 maintained dimensions of the body and the opening and  
after forming an information-carrying structure in the  
matrix body, is useable when making optical storage  
media.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 99/00910

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G11B 7/26, G11B 23/00 // B 29 D 17/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G11B, B29D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPAT, WPI, JAPIO

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages          | Relevant to claim No. |
|-----------|---|-----------------------|
| A         | WO 9604652 A1 (BIFANO, THOMAS, G),<br>15 February 1996 (15.02.96)<br><br>--                 | 1-8                   |
| A         | US 4954065 A (KOJI SHINDO ET AL), 4 Sept 1990<br>(04.09.90)<br><br>--                       | 1-8                   |
| A         | US 4354988 A (CLAUDE BRICOT ET AL),<br>19 October 1982 (19.10.82)<br><br>--                 | 1-8                   |
| A         | EP 0405568 A2 (E.I. DU PONT DE NEMOURS AND<br>COMPANY), 2 January 1991 (02.01.91)<br><br>-- | 1-8                   |

 Further documents are listed in the continuation of Box C. See patent family annex.

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## INTERNATIONAL SEARCH REPORT

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|-----------|--|-----------------------|
| A         | <p>Patent Abstracts of Japan, abstract of JP<br/>60-177452 A (DAICEL KAGAKU KOGYO K.K.),<br/>11 Sept 1985 (11.09.85)</p> <p>---</p> <p>-----</p> | 1-8                   |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

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|--|------------------|--|--|
| WO 9604652 A1                          | 15/02/96         | CA 2195109 A<br>CN 1159863 A<br>EP 0772875 A<br>JP 11501434 T<br>US 5503963 A<br>US 5783371 A                                  | 15/02/96<br>17/09/97<br>14/05/97<br>02/02/99<br>02/04/96<br>21/07/98                         |
| US 4954065 A                           | 04/09/90         | DE 3872907 A<br>EP 0284387 A,B<br>JP 63237234 A  | 27/08/92<br>28/09/88<br>03/10/88   |
| US 4354988 A                           | 19/10/82         | CA 1157607 A<br>EP 0015834 A,B<br>SE 0015834 T3<br>FR 2450683 A,B<br>JP 56051031 A<br>US 4407646 A                             | 29/11/83<br>17/09/80<br>03/10/80<br>08/05/81<br>04/10/83                                     |
| EP 0405568 A2                          | 02/01/91         | CA 2020175 A<br>CN 1048619 A<br>DE 69024415 D,T<br>HK 144496 A<br>JP 2116959 C<br>JP 3116564 A<br>JP 8027996 B<br>US 5188863 A | 31/12/90<br>16/01/91<br>31/10/96<br>09/08/96<br>06/12/96<br>17/05/91<br>21/03/96<br>23/02/93 |